

Butterflies and moths (Insecta, Lepidoptera) recorded at sea off Eivissa and Barcelona (Western Mediterranean) in October 1996

Constantí STEFANESCU

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This note reports some observations of migrant Lepidoptera recorded at sea during a trawling cruise that took place between 16-26 October 1996 off the south of Eivissa and Formentera. Nearly 50 examples belonging to 3 species of Rhopalocera and 11 species of Heterocera were identified. The possible origin of these migrants as well as the meteorological conditions that could have been involved in the migration are discussed. Additional comments on the predatory behaviour of some recorded migratory insectivorous birds are also provided.

Keywords: *Rhopalocera*, *Heterocera*, *Lepidoptera*, *migration*, *Western Mediterranean*.

RODALÒCERS I HETERÒCERS (INSECTA, LEPIDOPTERA) CAPTURATS A LA MAR ENTRE EIVISSA I BARCELONA (MEDITERRÀNIA OCCIDENTAL) L'OCTUBRE DE 1996. En aquesta nota es comenten una sèrie d'observacions de lepidòpters migradors realitzades en alta mar durant una campanya oceanogràfica que va tenir lloc entre el 16-26 d'octubre de 1996 al sud d'Eivissa i Formentera. En total es van identificar uns 50 exemplars pertanyents a 3 espècies de Rhopalocera i a 11 espècies d'Heterocera. Es discuteix el possible origen d'aquests exemplars i les condicions meteorològiques que podrien haver contribuït al procés migratori, així com altres observacions addicionals sobre la predació que van patir per part d'alguns ocells insectívors que també es trobaven en migració. **Paraules clau:** *Rhopalocera*, *Heterocera*, *Lepidoptera*, *migració*, *Mediterrània occidental*.

Constantí STEFANESCU, Can Liro, 08458 Sant Pere de Vilamajor, Barcelona.

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Introduction

Although the migratory habit in insects, and more particularly in Lepidoptera, happens to be a well documented phenomenon (e.g. Williams, 1958), many aspects of the processes involved are still poorly known. Much information has been gathered from the European conti-

nent, but up till now the available data has remained irregularly distributed. Thus, while in the British Isles and several countries of northern Europe a fairly deep knowledge has been achieved (e.g. Bretherton, 1983), there have been only a few studies concerning the Medi-

terranean basin. However, this area is particularly interesting from the migratory point of view, since it represents the connection between the African continent and central and northern Europe as well as a probable primary source of migrants to northern latitudes.

The aim of the present note is to provide new data on migrant Lepidoptera observed off the south of Eivissa (Balearic Islands) in 1996. Despite their fragmentary nature, these data are certainly interesting owing to the fact that they were obtained from a boat quite a distance off the coast, and during a period (16-26 October) generally poorly sampled.

Material and methods

The observations were made on board the research vessel B/O García del Cid, during the trawling cruise QUIMERA-I that took place between 16-

26 October 1996. The ship left from Barcelona on 16 October and between 17-26 October it surveyed the slope off the south of Eivissa and Formentera (Fig. 1). The exact position, date and timing of the different trawls in which migrant Lepidoptera were observed are detailed in Table 1.

While the trawls were taking place, the boat deck was surveyed in search of migrant Lepidoptera. In most cases they were found resting on the deck, but in some instances (e.g. *N. noctuella*, *P. unionalis*, *C. croceus*, *V. atalanta*, *C. cardui* and *M. stellatarum*) the examples were seen arriving or while flying over the sea.

There were also a considerable number of migrant birds some of which were observed preying upon different moth species. Whenever possible the species involved in these encounters were identified and are reported in the following section.

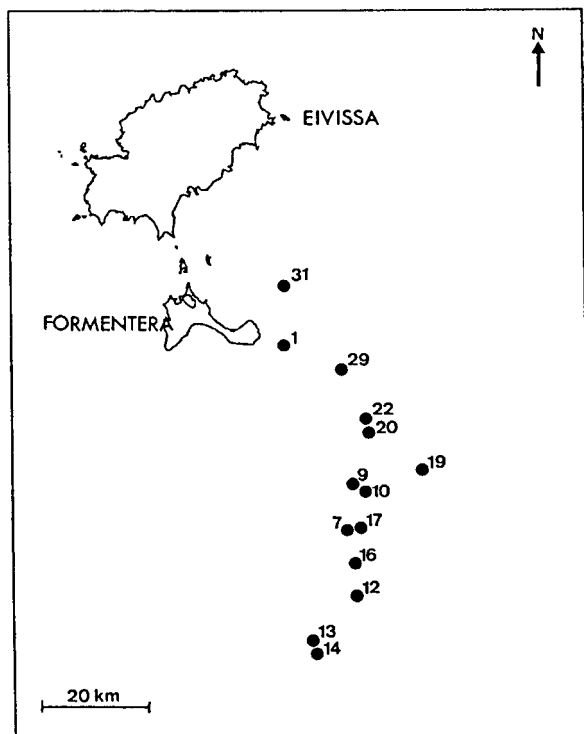
Table 1. Sample station data of the trawls where migrant Lepidoptera were detected. Time and station position is referred to the beginning of the sample. Bottom depth is reported at the start for each sample.

Taula 1. Dades de les pesques on es van detectar lepidòpters migradors. L'hora, la posició i la fondària corresponen el moment de l'inici de la pesca.

Station	Date	Local time	Latitude (N)	Longitude (E)	Depth (m)
1	17X96	10:37	38°44'70"	01°38'27"	271
7	19X96	9:17	38°19'75"	01°47'04"	1414
9	19X96	15:40	38°24'48"	01°47'33"	1221
10	19X96	17:56	38°23'87"	01°48'42"	1231
12	20X96	12:15	38°12'81"	01°47'99"	1590
13	20X96	15:22	38°07'34"	01°42'98"	1714
14	20X96	18:35	38°08'09"	01°48'86"	1709
16	21X96	12:16	38°16'22"	01°47'75"	1509
17	21X96	15:25	38°19'58"	01°46'77"	1421
19	22X96	8:52	38°25'93"	01°55'72"	1119
20	22X96	11:32	38°30'18"	01°49'18"	805
22	22X96	16:10	38°31'47"	01°49'19"	702
29	24X96	8:36	38°36'59"	01°46'06"	501
31	24X96	13:15	38°39'43"	01°38'57"	335

Fig. 1. Location of the trawls in which migrant Lepidoptera were observed.

Fig. 1. Situació de les pesques en què es van observar lepidòpters migradors.



M. stellatarum were also recorded off Barcelona.

Though the trawls began each day around 8 a.m. and continued until 8 p.m., almost all of the examples were recorded during day time. Although the deck lights of the ship were also searched for migrant Lepidoptera every night, no moth nor butterfly was detected at that time. It seems therefore that most migration took place during the day.

The following bird species were seen in migration during the cruise: skylark (*Alauda arvensis*), swallow (*Hirundo rustica*), white wagtail (*Motacilla alba*), robin (*Erithacus rubecula*), redstart (*Phoenicurus ochruros*), thrush (*Turdus* sp.), chiffchaff (*Phylloscopus collybita*), starling (*Sturnus vulgaris*) and chaffinch (*Fringilla coelebs*). White wagtail, robin, redstart, chiffchaff and chaffinch were the most common species and several individuals stayed on the ship for periods encompassing several hours. Predatory behaviour was frequently recorded in robin, redstart and chiffchaff, but only on one occasion (trawl 17) was I able to identify the species captured: *N. noctuella* by redstart, and *R. sacaria* by chiffchaff. Most probably the wings of *A. segetum* and *M. unipuncta* found on the deck (Table 2) were also the result of predation by some of the above mentioned birds. Although this predatory impact on the number of Lepidoptera was not assessed, there is no doubt that insectivorous birds killed an important proportion of the moths that stopped on the ship.

Results

Between 16-26 October nearly 50 examples belonging to 14 different species of butterflies (three species) and moths (11 species) were detected (Table 2). Besides the Lepidoptera, moderate numbers of unidentified Syrphid flies and Odonata were also migrating. Almost all the observations were made off the south of Eivissa and Formentera, 5-30 miles away from the coastline (Table 1). The only three examples of *V. atalanta* were seen on 16 October at 14-15 h, when the ship was leaving Barcelona harbour and was not further than one mile from the coast. Three examples of

Table 2. Butterflies and moths recorded at sea off Eivissa and Barcelona between 16-26 October 1996. (If recorded, sexes are indicated: m, male; f, female).

Taule 2. Papallones diürnes i nocturnes trobades en alta mar a la zona d'Eivissa i Barcelona els dies 16-26 d'octubre de 1996. (Sempre que ha estat possible, s'indiquen els sexes: m, mascle; f, femella).

Family (subfamily)	Species	Trawl	Individuals
Pyralidae (Pyraustinae)	<i>Udea ferrugalis</i> (Hb.)	16	1f
	<i>Nomophila noctuella</i> ([D.&S.])	7, 9, 17, 31	1,>5, 3, 1
	<i>Palpita unionalis</i> (Hb.)	7, 12, 13	1m, 1f, 1
Pieridae (Coliadinae)	<i>Colias croceus</i> (Geoff.)	1, 29	1, 1f
Nymphalidae (Nymphalinae)	<i>Vanessa atalanta</i> (Linn.)	off Barcelona	3
	<i>Cynthia cardui</i> (Linn.)	13, 29	1, 2m
Geometridae (Sterrhinae)	<i>Rhodometra sacraria</i> (Linn.)	9, 14, 16, 17	1f, 1, 2, 3
		19, 22, 29,31	1, 1, 1, 1
Sphingidae (Macroglossinae)	<i>Macroglossum stellatarum</i> (Linn.)	off Barcelona 13, 14, 22	3 1, 1, 1
Noctuidae (Noctuinae)	<i>Agrotis segetum</i> ([D. & S.])	10, 20	1f, 1 (wings)
	<i>Noctua pronuba</i> (Linn.)	7	1
(Hadeninae)	<i>Discestra trifolii</i> (Hfn.)	7	1m
	<i>Mythimna vitellina</i> (Hb.)	13	1
	<i>Mythimna unipuncta</i> (Hw.)	20	1 (wings)
(Amphipyriinae)	<i>Spodoptera exigua</i> (Hb.)	31	1f

Discussion

All the species reported display a well-known migratory behaviour. Following the classification of Eitschberger *et al.* (1991), *U. ferrugalis*, *N. noctuella*, *P. unionalis*, *V. atalanta* and *C. cardui* are seasonal migrants of first order, and late in the season the offspring of the early migrants are involved in return flights to the southern areas from where their parents originated. With the exception of *A. segetum* and *D. trifolii*, the rest of the species of Table 2 are classified by these authors as emigrants, that is, species that migrate northward within their area of occurrence and do not return to the original areas from which they came.

A. segetum is classified as dis migrant (species suspected as being migratory); *D. trifolii* is not included among the European migrants by Eitschberger *et al.* (1991) but Bretherton (1983) and Emmet (1992) mention its migratory behaviour in the British Isles.

The flight direction could only be determined unequivocally in the three individuals of *V. atalanta*, which were moving SW in a straight line parallel to the coast. A southward autumn flight to the overwintering sites has consistently been reported for this species by several authors (e.g. Williams, 1951; Benvenuti *et al.*, 1994). In central Italy, for exam-

ple, this southward flight is especially remarkable in October in areas close to the sea coast (Benvenuti *et al.*, 1994).

The other two butterflies seen, *C. croceus* and *C. cardui*, and the single hawkmoth species detected, *M. stellatarum*, were also probably moving southward, but this assumption could not be confirmed. The southward autumn flight of *C. croceus* seems to be well established in the British Isles (Williams, 1951), and there is some circumstantial evidence that it is quite a common feature in the Iberian Peninsula (Lack & Lack, 1951; Templado, 1977; C. Stefanescu, unpubl. data). The same is true for *M. stellatarum*, a species that has repeatedly been observed travelling south in autumn (Pittaway, 1993). On the other hand, though some southward migrations have been reported, the autumn movements of *C. cardui* remain quite unclear (Stefanescu, in press.).

On the contrary to butterflies and hawkmoths, which that appear to exert some control over their direction of displacement by flying largely within their flight boundary layer, long-distance moth migrants are transported on the winds (Pedgley *et al.*, 1995). On the European continent, such windborne movements allow some African and Mediterranean species to reach northern areas where their populations cannot establish permanently. Although the weather in the Mediterranean area is highly irregular, some atmospheric situations do prevail throughout the season and are usually reflected in a certain pattern of successive migratory waves into the northern temperate zone. Thus, in the British Isles, where Lepidoptera migration has been carefully monitored for many years, immigrations may take place at any time between late January and the middle of November but usually peak between the middle of August and the middle of October (Bretherton, 1983). Interestingly,

it should be noted that the greatest abundance of common migrants such as *U. ferrugalis*, *P. unionalis*, *R. sacraria*, *M. vitellina*, *M. unipuncta* and sometimes *N. noctuella* and *S. exigua* is normally reached in the British Isles during October (e.g. Bretherton & Chalmers-Hunt, 1979, 1990; Foster, 1989). According to Bretherton (1983) and Pedgley *et al.* (1995) most of these migrants arrive mainly across the south of the North Atlantic, from northern Spain, Morocco, Madeira, the Azores and the Canary Islands, but in some cases they may come from the south of the Mediterranean.

The observations reported here began just after a cold and very active front coming from the east Atlantic together with another one located on North Africa crossed the Iberian Peninsula and the western Mediterranean between 12 and 15 October. The next 10 days or so an area of high pressure was centred on the Iberian Peninsula and North Africa, the weather was very stable and the winds were very weak both at the sea level and at the 850-hPa level. Under these conditions it is difficult to envisage windborne long-distance migrations, because airflows suitable for carrying migrants were virtually nonexistent. One possibility that cannot be ruled out, however, is that the reported moths were first transported into the south-easterly airflow following the passage of the above mentioned fronts but became apparently stranded when the anticyclone was subsequently established over the area. If so, their origin would probably be found in North Africa, more specifically in Argelia or Tunissia. Once in the Balearic Islands, their transport to northern (e.g. Bretherton & Chalmers-Hunt, 1979, 1990) or southern latitudes (e.g. Johnson, 1995) would depend on the arrival of new fronts on the following days.

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